Please replace the paragraph beginning on page 1, line 24 with the following rewritten paragraph:

B16

Japanese patent publication (Kokoku) with a publication number 46032/1988 discloses a process for producing an aluminum nitride sintered body. According to the claim 1, aluminum nitride powder containing 1 weight percent of oxygen is mixed with 0.01 to 15 weight percent of the oxide of a metal element selected among yttrium, lanthanum, praseodymium, niobium, samarium, gadolinium and dysprosium to obtain mixed powder. The powder is then shaped and sintered to obtain an aluminum nitride sintered body having a high thermal conductivity and containing 0.01 to 20 weight percent of oxygen. According to "example 1" in the publication, aluminum nitride powder (with a mean particle diameter of 1 μm) containing 1 weight percent of oxygen is mixed with 3 weight percent of samarium oxide to obtain mixed powder. The powder is then subjected to hot press at a pressure of 300 kg/cm^2 and a temperature of 1800 °C for 1 hour to obtain a sintered body with a heat conductivity of 121 W·m/k at room temperature.

Please replace the heading on page 6, line 17 with the following rewritten heading:

B17

Detailed Description of the Invention

Please replace the paragraph beginning on page 7, line 27 with the following rewritten paragraph:

B18

The inventors have further studied the contents of aluminum oxide and samarium oxide and found the following relationship. That is, the volume resistivity of the sintered body at room temperature may be further reduced by controlling the molar ratio of a

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converted content of samarium calculated as samarium oxide to a calculated content of aluminum oxide (Sm_2O_3 / Al_2O_3) within 0.05 to 0.5. The content of Sm_2O_3 may be calculated by converting the content of samarium element in the sintered body to the content of Sm_2O_3. The content of Al_2O_3 may be calculated by the following steps. First, total content of oxygen atoms in the sintered body is obtained. Second, the content of oxygen in Sm_2O_3 is subtracted from the total content of oxygen to obtain the content of remaining oxygen. The content of Al_2O_3 is calculated under the provision that all the remaining oxygen atoms are bonded with Al atoms to form Al_2O_3 molecules.

B18 Con'td

Please replace the paragraph beginning on page 9, line 24 with the following rewritten paragraph:

B19

It is also possible to give a color of a low lightness (blackish color) to the surface of the aluminum nitride sintered body, by adding one or more transition metal elements selected from the group consisting of metal elements belonging to the periodic table groups IVA, VA, VIA, VIIA and VIIIA. Such color with a low lightness may be useful for reducing the color irregularity on the surface. Although such added transition metal element may be effective for reducing the lightness of the surface, the effects of the transition metal elements on the low volume resistivity and low activation energy of temperature dependency of volume resistivity have not been confirmed.

Please replace the paragraph beginning on page 10, line 27 with the following rewritten paragraph:

B20

The aluminum nitride sintered body may preferably have a lightness of not higher than N4 defined in "JIS Z 8721" and thereby generate a high quantity of heat radiation,

Substitute specification paragraphs

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B20 Cont'd

thus providing excellent heating property. The sintered body may be useful for a substrate constituting a heating member such as a ceramic heater and susceptor.

Please replace the paragraph beginning on page 11, line 5 with the following rewritten paragraph:

B21

The lightness will be described below. The surface color of a substance may be represented by three properties of color perception: hue, lightness and chroma. The lightness is a property for representing visual perception judging the reflectance of the surface of a substance. The representations of the three properties are defined in "JIS Z 8721". The representation of lightness will be briefly described. The lightness "V" is defined based on achromatic colors. The lightnesses of ideal black and ideal white are defined as "0" and "10", respectively. Achromatic colors between the ideal black and ideal white are divided into 10 categories and represented as symbols from "N0" to "N10". The categories are divided so that each category has a same rate or span in terms of visual perception of lightness. When actually measuring the lightness of an aluminum nitride sintered body, the surface color of the body is compared with standard color samples corresponding with "N0" to "N10" to determine the lightness of the body. The lightness is determined to the first decimal point, whose value is selected from "0" and "5".

Please replace the paragraph beginning on page 12, line 6 with the following rewritten paragraph:

B22

However, when the content of the second rare earth element is too large, the content of $SmAlO_3$ is increased and the content of $SmAl_{11}O_{18}$ is decreased in the intergranular phase, so that the formation of the network microstructure may be

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B23 Cont'd

interrupted. This tends to cause the increase of volume resistivity and activation energy of temperature dependency of volume resistivity. For preventing the problems, the molar ratio of a converted content of the second rare earth element "Re" calculated as rare earth oxide "Re_2O_3" to a converted content of samarium calculated as samarium oxide (Re_2O_3 / Sm_2O_3) may preferably be not higher than 2.0. The ratio may more preferably be not higher than 1.5 and most preferably be not higher than 1.2.

Please replace the paragraph beginning on page 12, line 18 with the following rewritten paragraph:

B23

For attaining the effect of the fine control of volume resistivity by the addition of the second rare earth element, the molar ratio of a converted content of the element "Re" calculated as "Re_2O_3" to a converted content of samarium calculated as the oxide (Re_2O_3 / Sm_2O_3) may preferably be not lower than 0.05 and more preferably be not lower than 0.1.

Please replace the paragraph beginning on page 12, line 24 with the following rewritten paragraph:

B24

When adding the second rare earth element, the crystalline phase of the inventive sintered body is mainly composed of AlN phase and the phase of aluminum-samarium complex oxide. The complex oxide phase typically contains $SmAl_{11}O_{18}$ phase and $SmAlO_3$ phase. It is considered that the second rare earth elements are mainly dissolved into the complex oxide phase. However, phase of complex oxide of the second rare earth element "Re" and aluminum, such as $Re_3A_5O_{12}$ phase, is formed in some compositions.

Substitute specification paragraphs

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Please replace the paragraph beginning on page 13, line 11 with the following rewritten paragraph:

B25

The second rare earth element other than samarium refers to the following sixteen elements: scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium and lutetium.

Please replace the paragraph beginning on page 13, line 27 with the following rewritten paragraph:

B26

In a preferred embodiment, the molar ratio of total of converted contents of all the rare earth elements "Re'' (including samarium) calculated as the oxides to a calculated content of aluminum oxide (Re_2O_3 / Al_2O_3) is 0.05 to 0.5. It is thereby possible to considerably reduce the volume resistivity of the sintered body at room temperature.. The ratio (Re_2O_3 / Al_2O_3) may preferably be not lower than 0.1 and more preferably be not higher than 0.4.

Please replace the paragraph beginning on page 18, line 3 with the following rewritten paragraph:

B27

4 types of AlN raw powdery materials were used, including 2 kinds "A'' and "B'' of commercial materials produced by reduction nitriding and 2 kinds of materials "C'' and "D'' produced by gaseous phase synthesis. "A'' contains 0.97 weight percent of oxygen, "B'' contains 0.87 weight percent of oxygen, "C'' contains 0.44 weight percent of oxygen and "D'' contains 1.20 weight percent of oxygen. A commercial powder of samarium

B

B27 Cont'd

oxide with a purity of not lower than 99.9 percent and a mean particle diameter of 1.1 μm was used.

Please replace the paragraph beginning on page 18, line 10 with the following rewritten paragraph:

B28

Each powder was weighed as shown in tables 1 and 4. Each weighed powder was then subjected to wet blending using isopropyl alcohol as a solvent, a nylon pot and nylon media for 4 hours to obtain slurry. After the blending, the slurry was collected and dried at 110°C. The thus dried powder was then subjected to heat treatment in an atmosphere at 450°C for 5 hours to remove carbon content contaminated during the wet blending to produce raw mixed powder. In the columns of "ratio (mol %)" of the mixed powder, the ratios of AlN powder and Sm2O3 powder were calculated ignoring the content of impurities.

Please replace the paragraph beginning on page 20, line 4 with the following rewritten paragraph:

B29

It is determined by using a rotating anode type X-ray diffraction system "RINT" supplied by "Rigaku Denki" under the following condition: CuKα, 50 kV, 300 mA, and 2θ=20 to 70 °.

Please replace the paragraph beginning on page 20, line 8 with the following rewritten paragraph:

B

It is measured by a method according to "JIS C 2141" from room temperature to about 400°C under vacuum. The test sample has the following parts: a plate with 50 mm×50mm×1mm; a main electrode with a diameter of 20 mm; a guard electrode with an inner diameter of 30 mm and outer diameter of 40 mm; and an applying electrode with a diameter of 45 mm. The electrodes are formed of silver. 500 V/mm of voltage is applied and a current is read one minute after the application of voltage so that the volume resistivity is calculated.

B30

Please replace the paragraph beginning on page 20, line 27 with the following rewritten paragraph:

A four-point bending strength at room temperature is measured according to "JIS R1601".

B31

Please replace the paragraph beginning on page 21, line 10 with the following rewritten paragraph:

The above AlN powder "A" was used. 0.235 mole percent of Sm_2O_3 was added to the AlN powder to obtain raw mixed powder, which was sintered at 1800°C to provide a dense body with a density of 3.30 g /cm^3 and an open porosity of 0. 04 percent.

B32

Please replace the paragraph beginning on page 21, line 17 with the following rewritten paragraph:

The volume resistivity was 6×10^{10} Ω·cm at room temperature (25°C) and 1×10^{8} Ω·cm at 300°C. In table 2, "6×10^{10}" was represented as "6E +10". The same method of representation will be applied in the following tables.

B33

Substitute specification paragraphs

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Please replace the paragraph beginning on page 25, line 14 with the following rewritten paragraph:

B34

As shown in Figs. 4 and 5, Sm phase was recognized in the sintered body according to the example 1 and comparative example 3. In the Sm phase, Sm atoms were distributed between AlN matrix forming spherical entities (designated as "spherical portions"). Further in the sintered body of the example 1, characteristic elongate portions were recognized. In the elongate portions, the content of Sm element was lower compared with that in the spherical portion. In other words, the spherical portions were brighter than the elongate portions. The elongate portions were distributed within the intergranular phase between AlN grains to form a kind of network-like entities. The substances constituting the spherical and elongate portions were identified by comparing the photographs by EPMA and the results of the above X-ray diffraction measurement. Consequently, it is assumed that the spherical portions with a higher content of Sm atoms are composed of SmAlO3 and the elongate portions forming network with a lower content of Sm atoms are composed of SmAl11O18. It is speculated that the volume resistivity of the sintered body is reduced by the presence of SmAl11O18 phase in the intergranular layers between AlN grains, forming conductive pass.

Please replace the paragraph beginning on page 26, line 7 with the following rewritten paragraph:

B35

When the AlN powder "B", "C" or "D" was used, substantially same properties as the example 1 were obtained within a certain range of the content of Sm2O3. Particularly when the AlN powder "C" with a low oxygen content was used, the content of Sm2O3 required for attaining a low volume resistivity shifted to a lower content range.

[**Substitute specification paragraphs**]

B

On the other hand, when the AlN powder "D'' with a high oxygen content was used, the content of Sm2O3 required for attaining a low volume resistivity shifted to a higher content range. The volume resistivity of the aluminum nitride sintered body may be controlled by adjusting the molar ratio of the contents of Sm2O3 to Al2O3, in addition to the content of Sm2 O3 (molar ratio) alone.

B35 Cont'd

Please replace the paragraph beginning on page 31, line 13 with the following rewritten paragraph:

B36

The current distribution analytic images of the sintered body according to the example 7, taken by an atomic force microscope (AFM), were shown in Figs. 8 and 9. The test sample has a shape of a plate with dimensions of 2 mm × 3 mm ×0.2 mm. The face of the sample for current distribution analysis was polished. The analysis was carried out using a model "SPM stage D 3100'' (probe type "DDESP'') supplied by Digital Instruments. The measurement was performed on contact AFM current measurement mode. A direct current (DC) bias was applied on the lower face of the sample and the current distribution on the polished face was measured using the probe.

Please replace the paragraph beginning on page 32, line 15 with the following rewritten paragraph:

B37

In the example 7, $SmAl_{11}O_{18}$ phase is continuous along the intergranular phase of AlN grains of the sintered body (along the outer surfaces of the grains), forming a kind of network microstructure. Apparently, if another phase made of a samarium-aluminum complex oxide other than $SmAl_{11}O_{18}$ forms continuous network microstructure, such microstructure contributes to the reduction of volume resistivity of an aluminum nitride sintered body. Such complex oxide includes $(Sm, A) (Al, B)_{11} (O, C)_{18}$. "A'' represents

B

B37 Cont'd

an element replacing a part of samarium site, "B'' is an element replacing a part of aluminum site, and "C'' is an element replacing a part of oxygen site. "A'', "B'' and "C'' include the following elements.

Please replace the paragraph beginning on page 32, line 25 with the following rewritten paragraph:

B38

"A'' includes the second rare earth element other than samarium as described above. "B'' includes Mg, Ga, Ti, Fe, Co, V, Cr, Ni or the like. "C'' includes N or the like.

Please replace the paragraph beginning on page 33, line 3 with the following rewritten paragraph:

B39

Aluminum nitride sintered bodies were produced substantially same as the experiment "A''. The formulation of raw material in the examples 15 to 19 was same as that in the example 7. The formulation of raw material in the examples 20 and 21 was same as that in the example 12. TiO_2 (a purity of 99.9 percent: a mean particle diameter of not higher than 1 μm) was added to the raw material of each example in a predetermined amount shown in table 6 as a blackening agent. The manufacturing and evaluating processes were same as those in the example 7.

Please replace the paragraph beginning on page 33, line 11 with the following rewritten paragraph:

B40

Table 6 shows the formulation of raw material, sintering conditions, results of chemical analysis of elements in the sintered body, and the converted contents of metal

Substitute specification paragraphs

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B40 Cont'd

elements in each sintered body according to each example. Table 7 shows the properties of each of the resulting sintered bodies. In table 6, an amount of added TiO_2 is represented as an amount (mole percent) calculated on the provision that total of amounts of AlN, Sm2O3 and Al2O3 is 100 mole percent. The content of Ti in each sintered body was determined by an inductively coupling plasma (ICP) spectrometry. The lightness of the surface color was determined according to "JIS Z 8721".

Please replace the paragraph beginning on page 36, line 27 with the following rewritten paragraph:

B41

(Experiment "D": Examples 22 to 33 and comparative examples 9 and 10: The effects of the addition of a second rare earth element other than samarium)

Please replace the paragraph beginning on page 37, line 3 with the following rewritten paragraph:

B42

Commercial powder of Y_2O_3, La_2O_3, CeO_2, Gd_2O_3, Dy_2O_3, Er_2O_3 , or Yb_2O_3 (each powder has a purity of not lower than 99.9 percent and a mean particle diameter of not higher than 2 μm) was used as a source of second rare earth element. The above reduction nitriding powder "B" was used as AlN powder. Sm_2O_3 powder used was the same as that in the experiment "A".

Please replace the paragraph beginning on page 37, line 8 with the following rewritten paragraph:

Substitute specification paragraphs

B

B43

Each powder was weighed according to the compositions shown in Table 8, and then each raw mixed powder was produced, shaped and sintered to obtain each sintered body, which was then evaluated, according to the same procedure in the experiment "A". The molar ratios of AlN powder, Sm2O3 powder and powder of the second rare earth oxide were calculated ignoring the content of impurities. Table 8 also shows each sintering temperature.

Please replace the paragraph beginning on page 40, line 1 with the following rewritten paragraph:

B44

In the column "compositions of sintered body", the contents of Sm_2O_3, the rare earth oxide and Al_2O_3 were calculated based on the contents obtained by chemical analysis of Sm, rare earth element and oxygen, according to the following procedure.

Please replace the paragraph beginning on page 40, line 20 with the following rewritten paragraph:

B45

The contents of Sm2O3, the oxide of the second rare earth element and Al2O3 calculated as described above were subtracted from 100 (mole percent) to provide the content of AlN. Each content of each component was represented using "mole percent" as a unit. This calculation is performed under the provision that total of the contents of AlN, Sm2O3, Al2O3 and the oxide of the second rare earth element is 100 mole percent.

Please replace the paragraph beginning on page 44, line 19 with the following rewritten paragraph:

Substitute specification paragraphs

B

Fig. 12 shows X-ray diffraction profiles of the sintered bodies according to the examples 24 and 25 and comparative examples 9 and 10. In the examples 24 and 25 and comparative examples 9 and 10, as shown in table 8, the amount of Sm2O3 was maintained constantly and the amount of CeO2 is increased stepwise when formulating the raw mixed powder. In Fig. 12, the diagrams of the examples 24, 25, and comparative examples 9, 10 were arranged vertically in series. Peak "C" is a representative peak of SmAl11O18 phase and peak "D" is a representative peak of SmAlO3 phase. Cukα ray and current of 50 kV and 300 mA were used.

B46

Substitute specification paragraphs

B